1974

Environmental Evaluation Report on the Big Mulberry Creek Basin in Franklin, Madison, Newton, Johnson and Crawford Counties, Arkansas

Edward E. Dale Jr.
University of Arkansas, Fayetteville

ENVIRONMENTAL EVALUATION REPORT ON THE BIG MULBERRY CREEK BASIN IN FRANKLIN, MADISON, NEWTON, JOHNSON AND CRAWFORD COUNTIES, ARKANSAS

Edward E. Dale, Jr.

WATER RESOURCES RESEARCH CENTER

Publication No. 21

UNIVERSITY OF ARKANSAS
Fayetteville

1974

ENVIRONMENTAL EVALUATION REPORT ON THE BIG MULBERRY CREEK BASIN IN FRANKLIN, MADISON, NEWTON, JOHNSON AND CRAWFORD COUNTIES, ARKANSAS

Final Report to

U.S. Army Corps of Engineers
Little Rock District

Contract No. DACW03-72-C-0138

October 1972

By

Edward E. Dale, Jr.
Project Director
Department of Botany and Bacteriology
University of Arkansas
Fayetteville

ENVIRONMENTAL EVALUATION REPORT ON
THE BIG MULBERRY CREEK BASIN IN FRANKLIN,
MADISON, NEWTON, JOHNSON AND CRAWFORD
COUNTIES, ARKANSAS

PREFACE

The environmental evaluation report which follows is based on information supplied by the Corps of Engineers, Little Rock District, available literature, field observations made during the summer of 1972, and results of research now in progress on natural features of the Big Mulberry Basin.

Since most major dams, levees, and flood retarding structures now in existence in the Ozarks have been constructed since about 1940, opportunities to make long term studies of their effects have been limited. Also, the natural vegetation, fauna, and archeology of the Big Mulberry Basin have not been extensively investigated, but available sources provide enough information for at least some reasonably sound predictions as to the effects of alternative water resource uses.

Principal investigators were Edward E. Dale, Jr. (Project Director, Botany and Esthetics), Alan F. Posey (Zoology), Paul L. Raines (Botany), Doy L. Zachry (Geology), and John H. House, Arkansas Archeological Survey (Archeology).

ENVIRONMENTAL EVALUATION REPORT ON THE BIG MULBERRY CREEK BASIN IN FRANKLIN, MADISON, NEWTON, JOHNSON AND CRAWFORD COUNTIES, ARKANSAS

TABLE OF CONTENTS

FIGURES

APPENDICES

GENERAL

1. Objective. The objective of this report is to evaluate the environmental effects of providing improvements on Big Mulberry Creek for flood control, municipal and industrial water supply, low-flow augmentation, pollution abatement, and other allied water resources purposes. The alternative actions considered include construction of a multiple-purpose lake, floodwater retarding structure system of 11 lakes, and a levee system. The proposals of stream preservation and no water resource development were also considered.

2. Location and basin description. Big Mulberry Creek basin lies in the west central part of Arkansas. The basin is about 46 miles long, and has an average width of about 11 miles. It has a drainage area of about 511 square miles. There are approximately 380 square miles of the basin that lie within the limits of the Ozark National Forest. The stream rises in the Boston "Mountains" in the southwestern corner of Newton County, about 3 miles southeast of Fallsville, Arkansas, and flows generally in a southwesterly direction. The total length of the stream is about 63 miles and is considered nonnavigable except for the lower 6 miles of the stream. The Big Mulberry Basin population in 1970 was approximately 5,000, compared to 4,900 in 1960 and 6,300 in 1950. The towns of Mulberry and Dyer, located in Crawford County, are the principal towns in the basin, and contain only 1 percent of the land in the basin. Approximately 82 percent is classified as woodland, 10 percent is pasture and grassland, and almost 7 percent is cropland. Figure 1 is a map of the Big Mulberry Creek basin and indicates the location of alternative projects.

3. Alternatives considered.

a. Multiple-purpose lake (White Rock Lake). A multiple-purpose project was considered at river mile 15.9 on Big Mulberry Creek. The lake would serve the needs for flood control, municipal and industrial water supply, and recreation. Approximately 6.5 miles of the stream would be inundated by the lake. The lake would have a capacity of 38,740 acre-feet and a surface area of 1,140 acres at conservation pool elevation of 580.0 feet above mean sea level. At top of flood control pool elevation of 628.0 feet above mean sea level, the lake would have a capacity of 127,500 acre-feet and a surface area of 2,525 acres. The dam would be a rockfill type with maximum height of 168 feet above the streambed.

b. Floodwater retarding structures. For effective flood damage reduction, sites for 11 floodwater retarding structures were located by the Soil Conservation Service. These 11 structures would retard the runoff from 173 square miles or about 46.5 percent of the watershed. Total storage capacity of the 11 structures would be approximately 58,110 acre-feet.

c. Levees. Levees were considered as an alternative to the lake for flood protection and as a compatible structural measure with respect to stream preservation. The levees would provide flood protection from headwater flooding for all floods up to and including a flood with a 20-year reoccurance frequency. The levees would protect agricultural lands in the lower alluvial plain section of the basin below White Rock dam site. The right bank levee would be approximately 3.5 miles in length with an average height of 13.2 feet. Approximately 115 acres of land would be required for the levee. The left bank levee would require approximately 150 acres over a length of about 5.3 miles. This levee would have an average height of 9.6 feet.

d. Stream preservation. The Big Mulberry Creek was considered for its stream preservation values. Public Law 90-542, Wild and Scenic Rivers Act and Guidelines for Evaluating Wild, Scenic and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System under Section 2, Public Law 90-542 were used in evaluating the creek.

e. No action. The effects upon the geological, biological, cultural, archeological, historical, and esthetic elements that could be expected if no action was proposed for the basin were evaluated.

MAIN STEM LAKE

1. Geological Elements

The construction of a main stem dam on the Mulberry Creek near White Rock will produce certain adverse environmental effects to geologic elements in the drainage basin. These adverse effects are restricted to the loss for future study of certain geologic features within the area inundated by the lake.

The area of inundation is underlain by sedimentary strata of the lower Atoka Formation. The succession consists of alternating units of shale siltstone and sandstone. Shale units dominate the interval but are poorly exposed. Sandstone and siltstone units from five to 30 feet in thickness are prominently exposed at various places along the present stream channel and in the adjacent valley walls. The sedimentologic characteristics of the sandstone units have been little studied in terms of determining the depositional environments that were important in their emplacement, and that controlled their distribution. Further south sandstone units of the lower Atoka Formation are important reservoirs for natural gas. These units are stratigraphically continuous with the sandstone units of the Mulberry basin. The sedimentologic effects that controlled the distribution of reservoir strata in the producing area are poorly understood. A more complete understanding of these effects might lead to more intelligent prospecting techniques for future gas reserves. Sedimentologic and stratigraphis studies of lower Atoka strata exposed in the Mulberry Creek drainage basin might lead to such an understanding.

Lower Atoka strata underlie most of the Mulberry Creek drainage basin. The proposed White Rock Lake would inundate only a small part of the exposures available for study. In addition the Atoka rocks are not extremely well exposed along the stream due to a mask of alluvial deposits. More useful exposures are present in deep valleys north of the stream. These exposures would not be effected by the construction of the proposed dam.

Portions of the axial trace of a single structural feature, the Jethro Anticline, would be inundated by the lake. The anticline is a poorly defined feature with dips ranging from 2 to 7 degrees to the north and 2 to 6 degrees to the south from the axial crest (Croneis, 1930, p. 239). The Jethro anticline is similar to others in the area, and would not be entirely inundated. The loss for future study of this feature is probably not a severe one.

The basic geologic effect produced by the construction of the main stem dam is the loss of several exposures of lower Atoka sandstone units that have not been adequately studied. Other exposures of lower Atoka strata would be available for geologic study in areas east and west of the main stem lake. The construction of the dam and resultant lake would not facilitate the future study of other exposures in the area and would produce no favorable benefits from the geologic point of view.

2. Biological Elements.

a. Botany. The most obvious effect of a main stem lake will be the total destruction of all terrestrial plant communities in the impoundment.

The loss of upland forest types that would be included in the impoundment is not likely to be serious since many examples of these vegetation types are found elsewhere, but loss of floodplain forests and gravel bar vegetation types should be carefully considered (Appendix A). The original extent of these types was much less than upland types. Furthermore, floodplain areas, which are the vegetation types most often eliminated by impoundments, are usually the best lands for agricultural use in the Ozarks region. Since the original vegetation of these types has already been mostly destroyed or severely altered by agricultural activities, good examples of such forests that remain should be considered as rare and unique plant communities.

The possible effects of man-made impoundments on the surrounding vegetation in the Big Mulberry Basin are indicated by observations of plant succession around the shores of previously established lakes in nearby areas such as Lake Wedington, Shores Lake, Lake Fayetteville, Lake Sequoyah, Beaver Lake, and others that were surrounded originally by oak hickory or other forest types similar to those found near the proposed site of White Rock Lake.

Results of studies made at Beaver Lake (Dale and Fullerton, 1964) following clearing shoreline areas but before impounded water reached the top of the power pool, showed that pioneer species along shore areas that were originally oak hickory forest were populated at first by a mixture of herbaceous species typical of the original oak-hickory forest floors and regrowth from stumps or underground parts of woody species. These areas were invaded later by various weedy species. Principal species present during the first year after clearing included ragweed (Ambrosia elatior), black-eyed Susan (Rudbeckia hirta), prairie tea (Croton monanthogynous), poverty oat grass (Danthonia spicata), panic grass (Panicum sp.), and broomsedge (Andropogon virginicus).

Early invaders after the first year along shorelines cleared in lowland forest type areas included pokeweed (Phytolacca americana), wild grape (Vitis sp.), mullein (Verbascum thapsus), ragweed (Ambrosia elatior), Bear's foot (Polymonia uvedalia), agrimony (Agrimonia rostellata), hazelbrush (Corylus americana), buckbrush (Symphoricarpos orbiculatus), virginia creeper (Parthenocissus quinquefolia), and yellow wing-stem (Verbesina virginica).

The early invaders from other areas adjacent to the lake such as pastures, and abandoned fields, depended somewhat on the vegetation composition of the areas, but principal species from most of these areas included bermuda grass (Cynodon dactylon), broomsedge (Andropogon virginicus), heath aster (Aster pilosus), ragweed (Ambrosia elatior), Johnson grass (Sorghum halepense), crabgrass (Digitaria sanguinalis), foxtail grass (Setaria sp.), and horseweed (Erigeron canadensis).

It must be recognized that early stages of succession in this area are highly variable depending on soil conditions, underlying rocks, land and water use of adjacent land, clearing operations before impoundment, and many other factors, but it is reasonable to assume that early invasion of shore areas will likely follow the sequences described above, or with similar vegetation.

After a period of two or three years, vegetation typical of shorelines starts to become established, and apparently persists for many years in a narrow band a few feet wide along the shore area.

Detailed ecological studies of such plant communities have not been made, but observations of shorelines of lakes that have been established at least 20 years, such as Lake Fayetteville and Lake Wedington indicate that principal herbaceous species of shore areas include smartweed (Polygonum spp.), rushes (Juncus spp.), various sedges, cattails (Typha latifolia), duckweed (Potamogeton sp.), and various other weedy grasses and broad-leafed herbaceous plants. One of the most conspicuous woody plants that becomes established early in succession is black willow (Salix nigra). Others include sycamore (Platanus occidentalis), sweetgum (Liquidambar strycaflua), buttonbush (Cephalanthus occidentalis), river locust (Amorpha fruticosa), and alder (Alnus sp.).

It was noted at Lake Wedington, which has been in existence since 1937 (35 years) that shoreline species have changed very little in the past 10 years, and that vegetation of upland forest communities a few feet above the high water mark do not appear to be different than on comparable upland sites located away from the lake. This indicates that at least for a period of 35 years in the case of Lake Wedington, and 22 years at Lake Fayetteville (dam constructed about 1950) that the lake has little influence on original vegetation a few feet away from the shoreline.

It seems probable that a narrow gravel-bar type vegetation will persist for many years around the shores of man-made impoundments in the Big Mulberry basin.

It is doubtful that a vegetation community resembling a floodplain forest community type will return around the lake shores for a very long time, although some typical floodplain species may return. Reasons for this center on the fact that the floodplain forests and vegetation of the lake shore develop under entirely different environmental conditions. A floodplain forest is subject to flooding and deposition of sediments from a river, making a deep, rich soil present in such areas. This seldom happens aroung lake shores except in situations where sediment is carried into it from cultivated areas around the lakes or as a result of flash floods.

When viewed in terms of long periods of time and sedimentation occurs in a lake, it is possible that a floodplain type forest may develop, probably first at the upper end, and gradually extend toward the dam area as soil is brought into the lake from the streams that flow into it. Since the upper part of the Big Mulberry drains an area with few farms and cultivated areas, it is primarily a clear water stream that does not carry much sediment and it will likely be a very long time before the upper part of the lake will fill with sufficient soil for a floodplain forest to develop.

The construction of a dam can produce far-reaching effects downstream, depending on how the water is released, when it is released, and many other factors.

One obvious effect of dam construction is the "scouring" effect in stream channels immediately below the dam. The influence of dams on environmental conditions usually diminishes as distances downstream increase.

Observations of vegetation below Lake Wedington dam during the last 15 years indicate that the typical floodplain forest type originally occupying this area is being invaded by upland species, and the habitat is becoming progressively drier because of the presence of the dam, which caused the cessation of flooding and deposition of soil by the stream.

A census of trees taken in an area about 200 yards below the dam in 1971 shows a much higher percentage of saplings typical of uplands such as black oak (_Quercus velutina_) and white oak (_Quercus alba_) than is found in typical floodplain forests located nearby (Raines, 1972).

Understory species typical of upland areas that have increased in number during the last 15 years include buckbrush (_Symphorocarpos orbiculatus_), beggerweed (_Desmodium_ spp.), stiff sunflower (_Helianthus divaricatus_), brome grass (_Bromus_ sp.), purple top (_Tridens flavus_), and upland species of panic grass (_Panicum_ spp.). These species are not listed or are uncommon as shown by data taken by Youree (1969) in a typical floodplain forest located about 12 miles northwest on the Illinois River in Benton County.

Results of observations on vegetation and habitat conditions below Lake Fayetteville and Lake Sequoyah, both in Washington County, indicate that typical floodplain vegetation type habitats are becoming drier more slowly than below Wedington dam, probably because stream flow is more continuous throughout the year.

It seems likely on the basis of observations in those areas with similar vegetation and habitats that changes will occur below a main stem dam in a manner similar to the observed changes at Lake Wedington, Lake Fayetteville, and Lake Sequoyah. The habitat will slowly become drier, and the typical floodplain vegetation community to some extent, particularly on its edges, will be invaded by upland species. No good basis exists at present for accurate predictions as to quantitative changes that will occur, or how long it will take.

b. Zoology.

(1) Effects in the Lake.

(a) Effects on Ichthyofauna.

Olmsted *et al* (1972) conducted a survey of the fishes of the Mulberry River and found 57 species of fish present in the study area which extended from the Mulberry River head waters at Oark to the confluence of the Mulberry and the Arkansas Rivers. (See Appendix B for complete list). Only 5 species previously reported in the literature were not taken in the survey. They are river red horse (*Moxostoma carinatum*), Skipjack herring (*Alosa chrysochloris*), mimic shiner (*Notropis voluncellus*), silver chub (*Hybopsis storerianus*), and silver minnow (*Hybognathus nuchalis*). Blue catfish (*Ictalurus furcatus*) has also been reported by commercial fishermen to be common in the mouth of the river (Olmsted *et al*. 1972). The study showed a strong tendency for the number of species to increase from the origin to the mouth of the river with 2 species being taken at station #1 (Oark) and 24 species taken at the last station (the confluence of the Mulberry and Arkansas rivers).

A study of pre- and post-impoundment of the Clinch River in Tennessee (Fitz, 1968) revealed that 12 of the 47 species of fish present before impoundment disappeared after impoundment. The study also showed 13 new species present after impoundment. Of the 47 species present before impoundment of the Clinch River, Olmsted *et al* (1972) found 26 in the Mulberry River. Of the 12 species that disappeared after impoundment of the Clinch, 4 were also found in the Mulberry. Finally, 6 of the "post-impoundment only" species from the Clinch were found in the Mulberry. It is probable that some of the species present now in the Mulberry will vanish after impoundment, particularly the rheophilic species. Appendix B indicates the species that will probably remain after impoundment and those that will probably disappear: (+) indicates no change or a beneficial change and (-) indicates a drecrease or loss.

Bacon *et al* (1968) compared age and growth of the longear sunfish (*Lepomis megalotis*) in the Kings River and Beaver Lake and found the average growth rate to be slightly greater in the lake than in the river. This species is primarily a stream fish but has adapted well to life in lakes.

Hall (1953) reported 22 species of stream dwelling fish still present in two Oklahoma lakes after the first year of impoundment. There was no evidence as to how long these species might be expected to remain in the lake habitat, but 9 of the species also occurred in the Mulberry River survey of Olmsted *et al* (1972). Prediction of the fate of these species in the Mulberry after impoundment is impossible at this time.

Jenkins and Leonard (1952) found that growth rate of channel catfish (*Ictalurus punctatus*) was greater in Tenkiller Lake and Lake Wagoner in Oklahoma than in the streams below the dams. A similar phenomenon was reported by Sneed and Thompson (1950) for crappie and largemouth bass (Micropterus salmoides) in Lake Texoma in Oklahoma. Growth rate was found to be higher in Arkansas in Beaver Lake (a young lake) than in Bull Shoals Lake (an older lake), but Jankins and Leonard (1952) stated that the accelerated growth rate associated with early impoundment decreases after the first few years, probably due to increasing population pressures, thus as the fish populations in the lakes mature, the growth rate decreases (Jenkins and Elkin, 1957). While lakes frequently provide good fishing for several years after impoundment, they gradually become less than satisfactory (Miner et al, 1967).

(b) Effects on Terrestrial Vertebrates.

Avifauna. Appendix B gives the known and probable species of birds occurring on the Mulberry River or in the river basin (James, 1967; Drs. Frances C. and Douglas A. James, personal communication, Baerg, 1951, and James and James, 1964) and the probable effects on the bird species if the river basin is flooded. The effects are listed as (+) for an increase, (-) for a decrease, (0) if unaffected, and a blank (no sign at all) if species absent during a particular season. The birds have been arranged into 3 categories for convenience. These categories are: 1) year-round residents, 2) summer residents only, and 3) winter residents only. The first category contains birds which breed in Arkansas but not necessarily in the Mulberry River area but they do occur there in at least one season. Category 2 contains only the Arkansas summer residents known to breed in the Mulberry region.

Inspection of Appendix C reveals that most of the breeding birds in the river basin (53 out of 67 (79%)) would decrease following completion of the reservoir. These decreases would be due to destruction of suitable habitat. Psychological factors related to habitat structure determine the acceptablility of a particular habitat by an avian species. Many species will only breed in lowland forests while others will only breed in shrubby old fields. Still others have very specific requirements within these habitats. The filling of the lake will flood all of the shrubby fields bordering the river and also the entire river basin within the extent of the lake. The habitat transition will then be from an aquatic habitat to a more or less upland deciduous forest, thus excluding all lowland species.

Fourteen of the 67 species (21%) will either increase or be unaffected by the change either because of adaptability to upland habitats or because of increased suitable breeding habitat.

Inspection of part 3 of Appendix C shows that 41 of the 60 winter resident birds (68%) will also decrease after fillings of the reservoir while the remainder will remain unchanged or will increase. Again, these changes are due to habitat modifications. It should be noted that if a lake is constructed, proper management of it could produce a water fowl refuge. The duck species indicated by (+) would be more numerous in a well managed lake. While most of these species do not spend the entire winter in northwest Arkansas they do stop for short visits on their way south. Proper management could assure larger numbers of visitors.

Mammal Populations. Lacking a more complete mammal list, the following statements will be based on the environmental inventory provided by the U.S. Army Corps of Engineers (1972), Selander (1956), and Dr. D. P. Reagan (personal communication). Of the 36 mammalian species listed in Appendix D, probably 10 (28%) will be adversely affected by inundation of the Mulberry River. These species either require moist to marshy habitat or are only found in shrubby fields and lowland forests. The remaining 26 species (72%) are commonly found in upland as well as lowland habitats and will probably not be greatly affected. It is probable that the reduction in forest edge habitat after flooding will reduce the white-tail deer population due to removal of much available food. As with Appendix B, a (-) indicates a reduction or probable loss of a species and a (+) indicates no great change.

Herpetofauna. Unfortunately there is no faunal list available on the reptiles and amphibians of the Mulberry River, so a detailed evaluation of the effects of the various proposed projects is not possible at this time. It is worthy of note that the Queen Snake (*Regina septemvittata*) is found at the confluence of the Mulberry River and Hurricane Creek, and that this is one of 3 localities in Arkansas from which this species has been collected (Conant, 1960). Furthermore, the Mulberry River is the only known locality to have produced the species recently. This habitat would be destroyed if a dam were constructed on the river thus eliminating one of the few remaining populations of the Queen Snake in Arkansas.

(2) Effects of Dam on Downstream Ecosystems.

Data provided by the preliminary report (U. S. Army Corps of Engineers, 1972) is insufficient to allow an exact assessment of the downstream environmental effects therefore estimates will have to be made on the 3 alternative possibilities which exist.

Alternative A - Reduced Stream Flow:

If the dam is such that stream flow can not or is not regulated and the volume of the river is reduced, most of the species marked (+) in Appendix B will probably be greatly reduced or will disappear entirely since they are adapted to deep pools and relatively calm water. Alternatively, those species marked (-) may continue to exist unless the water flow is permanently reduced since most of them are rheophilic or live in shallow pools (see Appendix B). This type of alternation may also create a more xeric habitat in the stream bed, thus changing the vegetation structure there. The resulting changes would have some negative effects on the avian and mammalian species in the immediate area. The reductions would be due primarily to habitat changes in the case of birds and to habitat and food quantity changes in the case of mammals.

Alternative B - Regulated Warm Water Stream Flow:

If the dam provides for a more uniform flow of the river and the water is released from the epilimnion of the lake and is thus warm, the faunal effects would be minimal. Population numbers might fluctuate to some extent due to a more constant flow of water but the number of species would probably remain unchanged. The same can be said for avian and mammalian species.

Alternative C - Cold Tailwaters from Hypolimnion of Reservoir:

The conversion of a warm water stream into a cold water stream results in rather sharp alterations of the fish and aquatic invertebrate populations originally present. Blanz et al (1969) compared the macroinvertebrate fauna of two natural Arkansas streams, the Kings River and the Buffalo River, to the cold tailwaters of Beaver Lake, Bull Shoals Lake, and Norfork Lake. The dominant groups in the Buffalo River were Trichoptera and Ephemeroptera; in the Kings River, Ephemeroptera, Trichoptera, and Gastropoda; below Bull Shoals, Amphipoda, Chironomidae, and Isopoda; below Norfork, Isopoda, Chironomidae, and Oligochaeta, and below Beaver, Chironomidae and Isopoda. These results show that dominant groups differ between natural streams and cold tailwaters. The study also showed that the diversity of organisms was greater in natural streams but that the benthic productivity was slightly higher in the tailwater streams. A similar change could also develop in the Mulberry River tailwaters.

A study of fish populations below Tenkiller Lake, Oklahoma, by Summers (1954) revealed low D. O. (Dissolved Oxygen) (0-1.5 ppm) in the water drawn from the hypolimnion. The 1.5 ppm level of D.O. supported only 13 species of fish and the number of species declined with reduction of D.O.

Eschmeyer (1944) in a study of the Clinch River below Norris Dam in Tennessee found many warm water species of fish still remaining after the change from warm to cold water. Earlier, Eschmeyer and Smith (1943) had studied reporduction of the fish in this river and found poorly developed ovaries or old ova which had not been released so he concluded that the species still present in 1944 would not grow or reproduce.

Cashner (1967) compared the populations of fish in the Kings River, the Buffalo River and the Black River in Arkansas with those below the dams of Beaver Lake, Bull Shoals Lake, and Norfork Lake, 3 cold tailwater habitats. The study showed a reduction in the fish species below the dams in the cold tailwaters as compared to the warm water tributaries of the White River.

Brown (1967) and Hoffman and Kilambi (1971) compared the ichthyofauna of the tailwaters of the 3 Arkansas lakes mentioned above and found a greater variety of species in the Beaver Dam tailwaters (29 spp.) than in Norfork (18 spp.) or Bull Shoals (6 spp.) tailwaters. As physicochemical changes occur in the tailwaters below new dams, many of the warm water species which had managed to survive there for a time begin to disappear. Certain species of warmwater fish can survive for several years but it is unlikely that reproduction can occur. As one moves downstream from a cold water outlet, the number of species begins to increase again (Cashner, 1967). The probable reason that Beaver Dam tailwaters still have a relatively large number of species is because Beaver Lake is still "new" compared to Norfork or Bull Shoals and the populations have not yet become stabilized (Bacon et al, 1968).

Thus it is possible to state that the conversion of a portion of the Mulberry River into a cold water stream definitely will reduce the fish populations. Cashner (1967) found a 60% reduction of species below Bull Shoals which is an "old" reservoir and has thus probably reached a stable stage.

Avian and mammalian populations would probably not be altered by this type of ecological change in the stream. The only exception to this assumption is the possible reduction in avian and mammalian species which depend on fish for food.

3. Archeology

Most of the area to be affected by a main stream dam was not surveyed during this preliminary reconnaissance, partially because of time limitations and partially because ground cover and vegetation made it inefficient to do so. Only the area around Milton Ford was visited, and most of the information on the four sites on record was obtained from a local informant. This man reports many more sites known to him from years of surface collecting along the bottomlands and terraces of the Big Mulberry further downstream which would be affected by a main stream dam.

The four sites on record (3FR7, 3 FR54, 3FR55 and 3FR56) have produced scattered stone tools which indicate a long period of occupation. From 3FR55 have come only dart points, indicating that this site possibly was only occupied during the Archaic period. The other sites indicate a longer and more concentrated occupation, and would warrent further investigation for delination of size and depth of cultural deposit.

4. Esthetic values.

If a dam is constructed to form a lake on the main stem of Big Mulberry Creek, the rapids, vegetation, cliffs, wildlife habitats and any other features of esthetic value of the impoundment area will be destroyed. However, these features will be replaced by a potentially beautiful lake in a pristine setting.

It is a matter of opinion as to whether a free-flowing stream or a lake has the greatest esthetic value. Many naturalists would consider anything that reflects the handiwork of man in a natural area, including a lake, is undesirable. Others hold the opposite view, that by manipulation of the environment to offset flooding problems and replacing a stream with a lake does not necessarily constitute degradation of esthetic values.

FLOODWATER RETARDING STRUCTURES

1. Geological Elements.

Strata of the Atoka Formation underlie most of the Mulberry Creek drainage basin. However sedimentary beds of the underlying Morrow Group are exposed in deep valleys north of the stream (Croneis, 1930, p. 170). Strata of the Morrow Group crop out continuously north of the Boston Mountain crest from northeastern Oklahoma to central Arkansas.

The Morrow Group is of early Pennsylvanian age. It is extremely fossiliforous and serves as the basis for the Morrowan Series of the Pennsylvanian System. It is an extremely important unit in that it serves as a standard by which other lower Pennsylvanian successions in North America are correlated. Its fossil content also provides a record of early Pennsylvanian life unriveled elsewhere in the United States. Stratigraphers and paleontologists are only now beginning to understand the geologic complexities of the Morrow Group north of the Boston Mountain Crest. The southern exposures in the Mulberry Creek drainage basin have been studied in only a surficial way. An understanding of the stratigraphy and paleontologic features of these southern exposures is extremely important to an understanding of the regional geology of the Morrow Group in that they represent the most basinward strata of the group available for surface investigation by geologists.

Fossiliferous strata of the Hale and Bloyd Formations (Morrow Group) are exposed in the channels and valley walls of most of the tributary streams that drain southward into Mulberry Creek. Their southern continuity along the streams is interrupted by the east-west trending Cass Fault System where they are downthrown to the south and buried by lower Atoka strata. To the north the Morrowan beds pass under strata of the Atoka Formation and are buried beneath the Boston Mountains.

Several of the proposed small tributary dams are so situated that the lakes formed by them would inundate valuable exposures of Morrowan strata. A stratigraphic succession ranging from the Cane Hill Member of the Hale Formation through the Bloyd Formation is exposed in the channel and valley walls of Cove and Fane Creeks (Wetzel, 1963). Several collections of goniatite cephalopods have been obtained from the succession indicating their potential as valuable fossil-bearing deposits. Other collections are needed. Dam Site C on Cove Creek would inundate a substantial part of the known exposures in this stream. A Morrowan succession in Indian Creek north of Taft contains strata ranging from the Hale Formation through the Bloyd Formation (Vyles, 1966). Limestone units within this succession are fossiliferous but extensive collections have not been obtained. Dam Site 4 on Indian Creek would inundate a substantial part of the exposed fossiliferous strata. Strata of the Bloyd Formation including the fossiliferous Brentwood and Kessler Members are exposed on Frileys and Davis Creeks. Several paleontological collections have been obtained from these rocks but their potential from an informative standpoint is essentially untapped. Dam Site 5 on Frileys Creek and Dam Site 6 on Davis Creek and the resultant lakes would inundate many of the fossil-bearing exposures.

Morrowan strata are also exposed along the courses of Mountain Creek, Herrods Creek, Spirits Creek and Salt Fork Creek. As no tributary dams are planned for these streams the exposures would not be effected. However the exposures eliminated by tributary dam construction would reduce to a large extent the already limited Morrowan exposures within the drainage basin.

Lakes produced by other small tributary dams would not inundate Morrowan strata, but would inundate excellent exposures of the Atoka Formation in stream channels both north and south of Mulberry Creek. These exposures are of far more value from an academic and perhaps practical standpoint than the few exposures along the Mulberry in the vicinity of the proposed White Rock Dam. This is true because the tributary streams have higher gradients and strata are less likely to be buried by alluvial deposits.

The Cass Fault System north of Mulberry Creek is a structural feature that warrants further study in that in it may be a growth fault genetically related to the growth fault systems of the Gulf Coast Basin. Dam Site 3 on Cove Creek site astride the trace of the fault, and would prevent further study of the structural relationships if constructed. However other exposures are available in the area and would probably be sufficient to define the structural aspects of the fault system.

The construction of numerous tributary lakes would seriously hinder further study of the Morrowan and Atokan stratigraphy of the area. The impact of inundation of particular fossiliferous strata of the Morrow Group created by construction of tributary lakes in the basin could be lessened and perhaps salvaged by preconstruction geologic studies of these isolated exposures. The construction of the dams would not aid in understanding the geology of this little studied region.

2. Biological Elements.

a. Botany. If dams are constructed to form tributary lakes in upland areas, the vegetation of upland ravines will be most affected. The types of forest communities present in such locations are highly variable, depending on the type of underlying rocks, soil conditions, slope, exposure, moisture conditions, forestry or agricultural activities in the area, and many other factors.

Most such areas generally support mixed oak-hickory or oak-hickory-pine (*Pinus echinata*) types, with black gum (*Nyssa sylvatica*), dogwood (*Cornus florida*), white oak (*Quercus alba*), hickory

(*Carya tomentosa* or *C. texana*), southern red oak (*Quercus falcata*), occurring as the most common principal species.

The effects of dam construction in upland ravine areas will cause the total destruction of these vegetation communities in the impoundment areas, and tend to cause habitats below the dam to become drier. Studies on changes in vegetation around impoundments on upland ravines have not been reported in the Arkansas Ozarks, but it seems reasonable to assume that succession would proceed along the same general trends as around a lake on the main stem of the Big Mulberry.

It is not likely that the destruction of plant community types of eleven upland ravines would constitute a serious loss of rare or endangered vegetation communities because many similar plant communities are found elsewhere on uplands throughout most of the Ozarks. However, construction of these floodwater retaining structures will reduce flooding in the Big Mulberry Creek area, and this could in turn, affect the floodplain forests of the area which owe their vegetation characteristics to occasional flooding.

b. Zoology. If dams are constructed on a series of the Mulberry River tributaries, varied effects will be observed on the surrounding ecosystems as well as the downstream ecosystems. The fish species found in the headwaters of these streams are adapted to riffle habitats or shallow pools and will not survive in a lake. Any statement applicable to the main stream lake will apply to the small headwater lakes except on a smaller scale with fewer species involved, particularly fewer fish species. Since many of the tributaries are small and have steep gradients, there will not be much shrubby field habitat destroyed by inundation so fewer avian and mammalian species would be affected by the change.

As in the case of the environmental changes below the main stream dam, the effects below the headwater dams are difficult to assess due to insufficient information concerning dam structure. If the water flow below the dams is restricted, the volume of the Mulberry River will be reduced, adversely affecting the species present (see: Effects of Dam on Downstream Ecosystems: Alternative A, this report). In the case of the mainstream dam, only the lower portion of the river would be affected but with the tributary dams, a much larger portion of the river would be involved.

If the water flow below the smaller dams is regulated, the overall flow of the Mulberry would be stabilized and the environmental changes would be slight, if any. Cold water releases would produce results similar to those below the mainstream dam, but involving fewer species.

3. Archeology.

It was not possible to check the areas which might be affected by all the flood retarding structures, either because of vegetation and ground cover which completely inhibited seeing anything on the surface of the ground. Some tributary areas were not checked at all; others were spot checked. Seven sites were located, two of which are small shelters (3JO32, 3JO54), and five of which are terrace sites (3MA85, 3JO57, 3 FR60, 3FR61, and 3 FR62). In all cases only scattered, sparse stone tool material was found, enough to indicate occupation of the area but not enough to provide information on possible time or cultural period. Since no pottery sherds were found on any of the sites, however, it is assumed that these were small Archaic campsites.

This sample of seven sites indicates that there will undoubtedly be many others along the tributaries which would be affected by the flood retarding structures, and which would require further work to locate and assess.

4. Esthetic values.

The construction of small tributary dams will result in total destruction of all features of asthetic values in the narrow ravines and valleys in the impoundment area and in the vicinity of the dam. Also, roads will have to be built to the dam sites for construction purposes before impoundment and maintenance afterward, possibly resulting in more total destruction to the natural environment than the disruption caused by the dam construction.

The problems of esthetic values are essentially the same as those concerned with construction of a dam on the main stem of Big Mulberry Creek. It is a matter of opinion whether an unspoiled natural ravine has more or less esthetic value than a beautiful small lake nestled in a natural setting on the uplands.

LEVEE SYSTEM

1. Geological Elements

The proposed levee system on Mulberry Creek near Mulberry would rest on Quaternary alluvial deposits (Hendricks and Parks, 1950, p. 79). The levees would not obscure any bedrock features, and would not produce adverse environmental effects to geological elements in the area.

2. Biological Elements

a. Botany. Levee construction in any area will generally destroy streamside vegetation if material from the stream bed is used in the levee, and the more rapid drainage of the area and prevention of flooding will produce a drier habitat back of the levees. This will cause typical wetland vegetation to be replaced eventually by vegetation characteristic of drier sites in those parts of the reclaimed area not put to agricultural uses.

Quantitative ecological studies have not been made on changes in vegetation caused by construction of levee systems in the Ozarks, but an extensive study by Turner (1931) in Illinois, where vegetation of lowlands is similar to that of the lower Big Mulberry Creek area provides good indications as to details of probable successional changes that may occur if levees are constructed. This study was made over a period of four growing seasons in several adjacent levee districts, with levees ranging in age from one to forty years.

The pioneer stage of plant succession, which lasted from one to three years, was described as being first dominated by weeds and tree seedlings. Principal species listed as present include pigweed (*Amaranthus retroflexus* and *A. blitoides*), horseweed (*Erigeron canadensis*), wild lettuce (*Lactuca scariola*), cocklebur (*Xanthium canadensis*), lambs quarters (*Chenopodium album*), tall ragweed (*Ambrosia trifida*), dock (*Rumex crispus*), and many others known to occur in the lower Big Mulberry area. Tree seedlings present in the pioneer stage of succession include both levee subclimax and climax species found on mature floodplain forest sites. These are silver leaf maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), american elm (*Ulmus americana*), black willow (*Salix nigra*), and others.

Vegetation succession of the second, third, and fourth stages covering about thirty years, developed toward a floodplain forest type. The fifth and sixth stages, which develop in about thirty and fifty years, respectively, are dominated by american elm, silver leaf maple, sycamore (*Platanus occidentalis*), willows, hackberry (*Celtis* sp.), black river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), and others. The woody understory included smooth sumac (*Rhus glabra*), elderberry (*Sambucus canadensis*), wild grape

(*Vitis* spp.), virginia creeper (*Parthenocissus quinquefolia*), and greenbrier (*Smilax* spp.). Principal forest floor species included stinging nettle (*Laportea canadensis*), bedstraw (*Galium aparine* and *G. circaezans*), touch-me-not (*Impatiens biflora*) and other species common to floodplain sites of the Ozarks.

A comparison of the results of this vegetation census made in Illinois by Turner (1931) shows a very close resemblance to vegetation of floodplain types as described by Dale and Fullerton (1964) and Youree (1969) in the Ozarks.

Observations of gravel bar and lowland forests of different ages in the Arkansas Valley and the lower part of Big Mulberry Creek indicate that bare areas and vegetation characteristic of gravel bars and floodplains will develop toward vegetation characteristic of drier sites if the levees are constructed, and that the stages of succession are likely to resemble closely those described by Turner over approximately the same amount of time.

b. Zoology.

If material for levee construction is taken from the stream as described by Turner (1931), the biota of the lower part of Big Mulberry Creek may be reduced considerably. Emerson (1971) reported a reduction of macroinvertebrate population in channelized portions of the Blackwater River as compared to unchannelized portions, and fish productivity declined from 256 Kg per acre in unchannelized portions to 51 Kg per acre in channelized sections.

If the borrow material is taken from areas near the stream instead of the stream bed, the environmental damage in the stream will be less and the stream fauna may be essentially unaltered.

The two major factors causing the changes will be destruction of favorable habitats and increased turbidity of the water.

3. Archeology.

Only a portion of the area of the levee system was walked during this preliminary reconnaissance. All this alluvial bottomland was good fertile land for farming and presumably for hunting as well in prehistoric times. A good many of the sites already on record with the Survey were in the area of the Mulberry Creek bottoms, some of them already partially destroyed by Interstate 40. However, at least seven sites (3FR48, 3FR50, 3FR52, 3 FR14, 3CW51, 3CW63, and 3CW16) will be affected by the levee system, and it can be assumed that others exist in areas not checked during the current work.

The artifacts and other cultural material found in these sites indicate heavy use of the bottoms and terraces along Mulberry Creek, particularly by Archaic hunters and gatherers. Some sites (3CW16, for example) have long been a source of early Archaic projectile points which have found their way into local collections. Dart points, spades, choppers, scrapers, and hammerstones have been found on the sites, and one site (3FR51 which may be in the levee area or in a borrow area), also produced a clay-tempered sherd on the surface. Indications are of the full range of prehistoric occupation along Big Mulberry Creek. Further investigation would be needed to provide information on the extent and nature of the occupation in prehistoric times.

4. Esthetic values

The proposed levees are in the lower part of the valley adjacent to farmlands and other developed areas, thus causing a less serious impact on the natural scenic features of the surrounding area.

If materials for constructing the levees are taken from the stream bed or banks, it will cause total destruction of any features of natural beauty such as the trees and other vegetation, and wildlife habitat. It may take many years for levee areas to revegetate unless careful management plans are followed. Overall, such structures as levees generally have very little to offer in terms of esthetic values.

PRESERVATION

1. Geological Elements

The inclusion of Big Mulberry Creek in the proposed Arkansas Scenic River System would have the effect of preserving the stratigraphic and paleontologic features adjacent to the stream. It would also allow geologists ready access to these features. In that the geologic features have not been adequately studied such a designation would be beneficial.

2. Biological Elements

a. Botany. The inclusion of Big Mulberry Creek in the Arkansas Scenic River System or if it is designated a National Scenic or Wild River, would have the effect of preserving in a relatively natural state most vegetation community types of the area. This would be of value for scientific studies of vegetation, and have esthetic values also.

Under succession of vegetation communities would preceed toward natural climax situations, and primeval forest types would eventually develop.

b. Zoology. Little can be added to what has already been said concerning the present ecological status of the Mulberry River. Appendices B, C, and D give at least a partial list of the faunal standing of the Mulberry River and the surrounding area. At present the river is practically unspoiled by pollution so the present faunal situation will remain unchanged if no stream alterations occur.

3. Archeology

Although it might well be that inclusion of the Big Mulberry in some kind of National River system would be more likely to lessen any effect on the archeological resources of the area, much would depend upon how the area would be used by the public. If land now farmed were put to pasture or trees, then sites now plowed would be saved from further disturbance. On the other hand, development of any kind which went along with use of the area by the public (landing ramps, boat docks, roads, trails, camping areas, etc.) would involve land alteration to some degree and could well affect sites. In addition, an increase in the use of the area by the public would make sites more available to collectors, and although the land would be government property, it would be difficult to protect sites in remote areas.

4. Esthetic values

Reports by the Arkansas State Committee on Stream Preservation (1969), Norman (1969), U. S. Army Corps of Engineers (1971) and field observations during the summer of 1972 show that Big Mulberry Creek is an exceptionally beautiful stream flowing through one of the most scenic areas of Arkansas. Its sparkling waters are essentially unpolluted and the stream is free flowing through a series of rapids and quiet pools. It winds between shaded banks and steep-faced bluffs, past such features as Whoop and Holler Rapids, Rotten Rock Bluff, and Wrecking Rock Rapids, against a backdrop of the beautiful and diverse flora of the surrounding forest, replete with abundant wildlife.

The average fall of the river is 20 feet per mile although it drops 50 feet in a mile and a quarter in the gorge below Hurricane Creek. It is floatable 80 percent of the year, and has a canoeist difficulty rating range from medium to difficult.

Except for approximately the lower 12 miles, shorelines and scenic vistas are mostly unchanged by man. Some areas of the stream have very little access, and access elsewhere is limited to a few crossroads. There are no extensive paralleling roads in the area (U.S. Army Corps of Engineers, 1971).

The Big Mulberry has been included in the proposed Arkansas Scenic Rivers System with Class "A" status (State Committee on Stream Preservation, 1968). Evaluation on the basis of standards as promulgated by Public Law 19-542, Section 2, 90th Congress, S. 119, and Guidelines for Evaluating Rivers Under Public Law 90-542 (U.S. Department of the Interior, U.S. Department of Agriculture, 1970) indicates that the Mulberry should be classed as a scenic river. Agricultural use and development along the banks of the last 12 miles of the Mulberry, and the fact that U.S. highway 64 and the Missouri Pacific railroad crosses its lower reaches preclude its classification as a wild river. If the last 12 miles were not included, it is possible that all of the upper part could be classed as a wild river.

If Big Mulberry Creek were included in the Arkansas Scenic River System or as a National Wild or Scenic River and protected by standards promulgated, it would develop into an area of even greater asthetic value than it has at present.

NO ACTION

1. Geological Elements

Most of the area within the Mulberry Creek drainage basin is also within the boundaries of the Ozark National Forest. This is especially true of the important Morrowan and Atokan exposures in deep valleys north of the stream. If no action is proposed for the basin these exposures will probably remain available for unlimited future study. Most of the land adjacent to the stream is privately owned. Geologists interested in features adjacent to the stream channel are dependent upon a favorable response from property owners to gain access. This currently is not a problem because the owners are few and usually friendly. However in future years as pressure for outdoor recreation increases land owners will become more restrictive about access to their property. No trespassing signs have increased in number within the private sector over the past four years. This would hinder unlimited study of features exposed in private areas.

2. Biological Elements

Since the results of no aetion will depend on so many other factors, it is not possible to predict all effects with much accuracy. However, it is likely that if no action is taken, the vegetation and animal communities would remain essentially as they are today, but eventually, commercial development, agriculture and forestry, and recreation activities will degrade the natural features of the plant and animal communities present at an increasing rate as the population of the area becomes larger and economic activities increase.

3. Archeology

It seems possible that the least effect to the archeological sites and resources of the areas would result if no federal action were taken and the land and river continued to be used as it is currently. Little land is in cultivation, and sites are difficult to see or access is difficult.

Though our knowledge of the prehistory of the basin of Big Mulberry Creek is still very incomplete, the results of the reconnaissance just completed do justify a few cautious observations. No attempt will be made to discuss in detail the prehistory of the portion of the basin in the alluvial valley of the Arkansas River as that has been covered by Hoffman (1965) and Bond (1971).

Intensity of Occupation

With the exception of the portion of the basin below stream mile 12, there is virtually no land under cultivation in the basin of Big Mulberry Creek. Considering this fact, the frequency with which prehistoric cultural material was found whenever small areas of soil were exposed or disturbed indicates the probability of relatively intensive prehistoric occupation in all portions of the basin.

Topographic Positions of Sites

Sites in the Mulberry basin have been found on alluvial terraces near streams, on low knolls overlooking stream bottoms, and in rockshelters. Our knowledge of the assemblages present at any site in most portions of the basin is too limited to permit any conclusions as to the relationship between the cultural-historical position of sites or their possible functional specializations and their topographic positions. It seems likely that prehistoric occupation was heavier and more sedentary in the region of the mouth of Big Mulberry Creek during the early and late Ceramic stages. It also seems probable, due to the suitability of the large bottomlands for agriculture, that occupation during these times in the upper portions of the basin was concentrated along Big Mulberry Creek rather than on the smaller tributary streams. However, direct evidence of occupation along Big Mulberry Creek was especially difficult to obtain due to the particularly heavy ground cover in the bottomland pastures and hayfields. Since, in the Mulberry basin as in most of the Boston Mountains, even rather small streams have extensive bottomlands, agricultural communities might have been present even along some of the tributary streams in the basin.

Since the streams in the basin are prone to flooding and there are sites on both lower and higher terraces, it seems probable that the more permanent settlements were on higher terraces while the sites on lower terraces were temporary and/or of a specialized function. Such a hypothesis seems to be supported in the case of the Beneux Bottoms locality by the fact that the larger more intensively occupied sites were on higher terraces.

At two sites in the basin, 3JO52 and 3JO53 on Little Mulberry Creek, there is evidence of 20 cm. or so of recent alluvium overlying the topmost artifact-bearing strata. The possibility of recent alluvium covering many of the sites should be taken into consideration in assessing the results of this reconnaissance. It seems most probable that this alluviation took place chiefly during the 19th and early 20th century when severe erosion was taking place in most portions of the Ozarks.

Culture History

The sample of artifacts from the basin is much too small to permit more than minimal observations concerning the culture history of most portions of the basin of Big Mulberry Creek. Artifacts have been found which are sufficiently diagnostic to reflect some of the stages of occupation in the basin, but it is doubtful that the small artifact sample reflects the total range of the prehistoric occupation.

The prehistory of the vicinity of the mouth of Big Mulberry Creek has been summarized by Hoffman (1965) and briefly summarized in the "Archeological Background" section of this report. Our data from the upper portions of the basin is much more limited.

The Dalton point found in the abandoned farmhouse at site 3MA85 on Little Mulberry Creek in Madison county may indicate an occupation of that portion of the basin beginning with the start of the early Archaic stage, perhaps as early as 9000 years ago. However, the circumstances of its being found are highly ambiguous.

The significance of the two straight-based, contracting-stemmed points with ground stem edges said to have been found in the vicinity of the shelter at Tobe Hill Mines (3FR8) is only slightly less ambiguous. Similar points found in the lower levels of Breckenridge Shelter in Carroll county (Wood, 1963) are thought to belong to the early Archaic stage (Scholtz, 1969). However, since the small collection from 3Fr8, of which these points were a part, was not catalogued the provenience data is not highly reliable.

Corner-notched and square-stemmed projectile points which are probably indicative of middle to late Archaic occupation were found at 3FR46, 3FR61, 3JO57, and 3JO30.

The most intensive occupation of the basin seems to have been that associated with the dart points with pointed or rounded contracting stems. These are presumably varieties of the Gary type (Suhm and Jelks, 1962) and probably date from the end of the Archaic stage at the latest and most probably from the early ceramic stage. Such points were found at 3FR46, 3JO53, and 3JO57. J. D. Casey reports finding such points frequently at Beneux Bottoms and elsewhere in the basin.

Clay-tempered pottery is associated with the early ceramic Gober complex at the mouth of Big Mulberry Creek and a number of sherds of clay-tempered pottery were found at 3FR46. One sherd of clay-tempered pottery was found at 3FR51 in Beneux Bottoms. Pottery is reported from many other sites in the basin, both open sites and shelters, but in most cases it was impossible to tell whether clay- or shell-tempered pottery was referred to.

Argillite "hoes", one of the hallmarks of the Gober complex, have been found at 3FR47, and apparently, at 3FR58.

It is probable that further work at 3FR51 and 3FR46, and probably other sites as well, would reveal early ceramic stage compounds related to those of the Gober complex.

Information provided by George Freeman seems to indicate the presence of the archeological remains of a large late ceramic stage settlement at site 3FR58 on the south side of Big Mulberry Creek. Large sites of this stage are extremely rare in the Ozarks, and the possible presence of such a site on the upper reaches of Big Mulberry Creek is especially interesting.

From Mr. Freeman's report the same complex seems to be present at 3FR59 nearby.

Arrowpoints have been found at numerous sites in the Mulberry basin including 3JO53 (on Little Mulberry Creek), 3FR58, 3FR59, 3FR57, 3FR8, 3FR46, 3FR7, 3FR54, 3FR53, and 3FR51. Though it is possible that these finds could relate to a final early ceramic stage occupation, it seems more likely that they relate to a late ceramic stage occupation in the basin. This view is supported by the find of one leached shell-tempered sherd at site 3JO52 on Little Mulberry Creek and by the fact that some of the arrowpoints from 3FR7, 3FR54, and 3FR8 are of the "willow-leaf" or Nodena type (Bell, 1958) which is most common in late Mississippian stage components in eastern Arkansas (Morse 1969).

The presence of Osage and Cherokee groups in this part of Arkansas in early historic times is known from documentary sources but no known archeological remains in the Mulberry basin are attributable to these groups.

Also known from documentary sources is the presence of a brief historic settlement, Mulberry, dating 1816-17 somewhere in the lower portion of the basin. The exact location of this settlement is not known.

Rock chimneys, rock fences, and other remains of 19th century farmsteads are quite common throughout the basin of Big Mulberry Creek and could be considered to constitute an archeological resource. The remains of an early pottery kiln are reported to exist somewhere along Herrod's Creek in northeastern Franklin county (Ken Cole, personal communication).

Prehistoric Settlement/Subsistence Systems

Data for reconstruction of prehistoric settlement/subsistence systems in the Mulberry basin are even more inadequate than that for reconstruction of culture history. Some of the data does, however, shed some light on the probable prehistoric economy and settlement pattern and provide a basis for formulation of some working hypothesis.

It is probable that the Archaic stage cultures of the basin had a subsistence pattern based on a seasonal round of hunting, fishing, and collection of wild plant foods. However, these cultures are too poorly known in all portions of the Ozarks for this to be much more than a hypothesis.

There is much reason to believe that the early ceramic stage occupation of the Ozark Reservoir basin included more or less sedentary agricultural communities (Hoffman, 1965, Scholtz, 1969, Bond, 1971). The presence of argillite "hoes" with soil polish on their bits at 3FR46 and the reported presence of "hoes made out of black flint" at 3FR58 suggest that agriculture played at least some role in the economy of the basin during the early and/or late ceramic stages. The large bottomland fields that extend far up Big Mulberry Creek were probably quite suitable for prehistoric agricultural methods and the apparent presence of a large late ceramic stage site at 3FR58 suggests the presence of a community practicing relatively intensive cultivation of bottomland gardens.

The finds of arrowpoints at sites such as 3JO53 and 3FR57 which have little or no shell-tempered pottery may represent temporary hunting camps used by late ceramic stage communities that had more permanent settlements at 3FR58 or other sites in the basin. It is likely that further investigation would reveal other sites similar to 3FR58 in the basin.

4. Esthetic values

If no action were taken to protect Big Mulberry Creek, it would probably retain its esthetic values for many years, but as population increased and as economic growth continues, it is likely that the area will suffer slow esthetic degradation.

LITERATURE CITED

Bacon, E. J., Jr., S. H. Newton, R. V. Kilambi and C. E. Hoffman. 1968. Changes in the ichthyofauna in the Beaver Reservoir tailwaters. Proc. 22nd Ann. Conf. S. E. Assoc. Game and Fish Comm. 22:245-248.

Baerg, W. J. 1951. Birds of Arkansas. Agri. Exp. Sta. Bull. 258. University of Arkansas College of Agriculture, Fayetteville, Arkansas.

Bell, Robert E. 1958. Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society, Special Bulletin, No. 1. Oklahoma City.

Blanz, R. E., C. E. Hoffman, R. V. Kilambi and C. R. Liston. 1969. Benthic macroinvertebrates in cold tailwaters and natural streams in the state of Arkansas. Proc. of 23rd Ann. Conf. of the S. E. Assoc. of Game and Fish Comm. p. 281-292.

Bond, Clell L. 1971. The Spinach Patch Site 3FR1, and the River Bank Site, 3FR23, West Central Arkansas. Manuscript on deposit at Southeastern Archeological Center and University of Arkansas Museum.

Brown, J. D. 1967. A study of the fishes of the tailwaters of three impoundments in northern Arkansas. Unpublished Master's Thesis. University of Arkansas.

Cashner, R. C. 1967. A survey of the fishes of the cold-tailwaters of the White River in northwest Arkansas; and a comparison of the White River with selected warm-water streams. Unpublished Master's Thesis, University of Arkansas.

Conant, R. 1969. The Queen Snake, *Natrix septemvittata*, in the interior highlands of Arkansas and Missouri, with comments upon similar disjunct distributions. Proceedings of Acad. of Natur. Sci. of Phil. 112:25-40.

Croneis, Cary. 1930. Geology of the Arkansas Paleozoic area: Arkansas Geological Survey Bull. No. 3.

Dale, Edward E., Jr., and T. M. Fullerton. 1964. Final Report on Ecological Investigations of Existing Vegetation in the Pre-Impoundment and Watershed Area of Beaver Lake. Bureau of Sport Fisheries and Wildlife and The University of Arkansas.

Emerson, J. W. 1971. Channelization: a case study. Sci. 173: 325-326.

Eschmeyer, R. W. 1944. Fish migration into the Clinch River below Norris Dam, Tennessee. J. Tennessee Acad. Sci. 19:31-41.

Eschmeyer, R. W. and C. G. Smith. 1943. Fish spawning below Norris Dam. J. Tenn. Acad. Sci. 18:4-5.

Fitz, R. B. 1968. Fish habitat and population changes resulting from impoundment of Clinch River by Melton Hill Dam. J. Tenn. Acad. Sci. 43:7-15.

Hall, G. E. 1953. Preliminary observations on the presence of stream-inhabiting fishes in Tenkiller Reservoir, a new Oklahoma impoundment. Proceedings of the Oklahoma Acad. Sci. 34:34-39.

Hendricks, T. A., and Parks, Bryan. 1950. Geology of the Fort Smith District, Arkansas: U. S. Geol. Survey Prof. Paper 221 E.

Hoffman, C. E. and R. V. Kilambi. 1971. Environmental changes produced by cold-water outlets from three Arkansas reservoirs. Water Resources Research Center Publication No. 5.

Hoffman, Michael P. 1965. An Archeological Survey of the Ozark Reservoir in West Central Arkansas. Manuscript on deposit at the Southeast Archeological Center and the University of Arkansas Museum.

James, D. A. and Frances C. James. 1964. The seasonal occurrences of Arkansas birds. Ark. Acad. of Sci. 18:20-30.

James, Frances C. 1967. Summer birds along the Buffalo River. Ozark Soc. Bull. 1:6.

Jenkins, R. M. and R. E. Elkin. 1957. Growth of White bass in Oklahoma. Okla. Fish. Res. Lab. Rept. No. 60.

Jenkins, R. M. and E. M. Leonard. 1952. Initial effects of impoundment on the growth-rate of Channel Catfish in two Oklahoma reservoirs. Proceedings of the Okla. Acad. Sci. 33:79-86.

Miner, F. D., L. O. Warren, and A. J. Iovino. 1967. Bottom fauna of Beaver Reservoir. Ecological investigations related to fish production in Beaver Reservoir following impoundment 1965-1966. U.S. Dept. of Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife.

Morse, Dan F. 1969. Introducing Northeast Arkansas Prehistory. Arkansas Archeologist 10:13-30.

Norman, Dean. 1969. Thunder on the Mulberry. Ozark Soc. Bull. 3:6-7.

Olmsted, L. O., G. D. Hickman, and D. G. Cloutman. 1972. A survey of the fishes of the Mulberry River, Arkansas. Water Resources Research Center Publication No. 10, University of Arkansas, Fayetteville, Arkansas.

Raines, Paul L. 1972. The Ecological Life History of _Elymus virginicus_ L. var. _glabriflorus_ (Vasey) Bush. Unpublished Doctoral Dissertation. University of Arkansas.

Scholtz, James A. 1969. Summary of Prehistory in Northwest Arkansas. The Arkansas Archeologist 10:51-60.

Sealander, J. A. 1956. A provisional check-list and key to the mammals of Arkansas (with a-notations). The Amer. Midland Naturalist 56:257-296.

Sneed, K. E. and W. H. Thompson. 1950. The age and growth of white crappie and largemouth black bass in Lake Texoma. Oklahoma Fish Manag. Rep. No. 19. Oklahoma Fisheries Experiment Station: 32 p. mimeo.

Suhm, Dee Ann and Edward B. Jelks. 1962. Handbook of Texas Archeology: Type Descriptions. Texas Arch. Soc., Special Publication No. 1. Texas Memorial Museum, Bulletin No. 4. Austin.

Summers, P. B. 1954. Some limnological and fish distribution observations in the Illinois River below Tenkiller Reservoir. Proc. Okla. Acad. Sci. 35:15-20.

The State Committee on Stream Preservation. 1968. Stream Preservation in Arkansas. Report of the State Committee on Stream Preservation. Little Rock, Arkansas.

Turner, L. M. 1931. Plant succession on levees in the Illinois River Valley. Transections of the Illinois State Academy of Science. 24:94-102.

U.S. Army Corps of Engineers. 1971. Environmental inventory of Big Mulberry Creek Basin in Franklin, Madison, Newton, Johnson, and Crawford Counties, Arkansas. U.S. Army Corps of Engineers, Little Rock District. Little Rock, Ark.

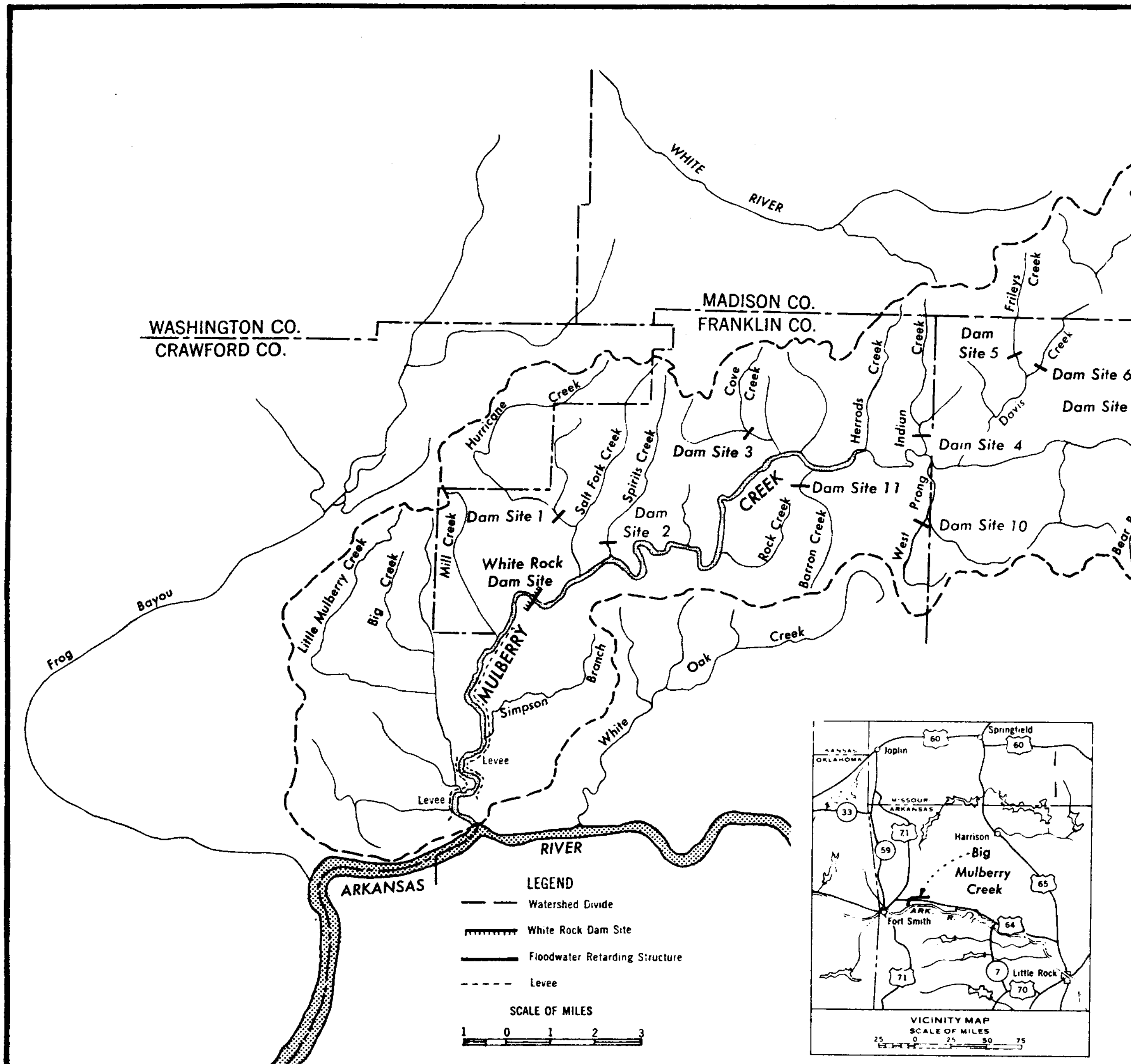
U.S. Department of the Interior and U.S. Department of Agriculture. 1970. Guidelines for Evaluating Wild, Scenic, or Recreational River Areas Proposed for Inclusion in the National Wild and Scenic River System Under Section 2, Public Law 90-542. Washington, D. C.

Vyles, Charles H. 1966. Geology of the Indian Creek area, Franklin and Johnson Counties, Arkansas: Unpublished Master's Thesis, University of Arkansas.

Wetzel, E. R. 1963. Geology of the Cass area, Watalula Quadrangle, Franklin County, Arkansas: Unpublished Master's Thesis, University of Arkansas.

Wood, W. Raymond. 1963. Beckenridge Shelter - 3CR2: An Archeological Chronicle in the Beaver Reservoir Area. In Arkansas Archeology 1962, edited by Charles R. McGimsey III, pp. 67-96. Arkansas Archeological Society. Fayetteville.

Youree, John T. 1969. The Vegetation and Soils of Selected Sites near Lake Wedington, Arkansas. Unpublished Master's Thesis. University of Arkansas.



ARKANSAS RIVER WATERSHED BIG MULBERRY CREEK BASIN

BIG MULBERRY CREEK, ARKANSAS

LOCATION AND VICINITY MAP

SCALE: AS SHOWN

U. S. ARMY ENGINEER DISTRICT, LITTLE ROCK

LITTLE ROCK, ARKANSAS, DECEMBER 1972

FIGURE 1

ENVIRONMENTAL EVALUATION REPORT
APPENDIX A
PRINCIPAL FOREST COMMUNITIES OF THE BIG MULBERRY BASIN IN FRANKLIN, MADISON, NEWTON, JOHNSON, AND CRAWFORD COUNTIES, ARKANSAS

Prepared by

University of Arkansas

for the
U. S. Army Corps of Engineers
Little Rock District

Little Rock, Arkansas
October 1972

APPENDIX A

PRINCIPAL FOREST COMMUNITIES OF THE BIG MULBERRY BASIN*

GRAVEL BAR TYPE

Common Name	Scientific Name
Trees	
Black Willow	*Salix nigra*
Sycamore	*Platanus occidentalis*
Black river birch	*Betula nigra*
Ward's willow	*Salix caroliniana*
Forest Floor Species	
Shrubs	
Witch Hazel	*Hamamelis virginiana*
River locust	*Amorpha fruticosa*
Herbs	
Smartweed	*Polygonum* spp.
Water willow	*Jussiaea leptocarpa*
Rush	*Juncus* sp.
Bulrush	*Scirpus* sp.

FLOODPLAIN TYPE

Common Name	Scientific Name
Trees	
Silver leaf maple	*Acer saccharinum*
American elm	*Ulmus americana*
Green ash	*Fraxinus pennsylvanica*
Sweet gum	*Liquidambar strycaflua*
Blue beech	*Carpinus caroliniana*
Box elder	*Acer negundo*
Black gum	*Nyssa sylvatica*

---

*Based on vegetation census results (E. E. Dale, Jr.) taken in 1963, 1969, and 1970 and observations in 1972. The dominants and important secondary species only are listed. The plants listed as present in each community type, in approximate order of importance, are a composite list representative of at least two or more plant communities of the same type. The community types are listed in approximate order from the most moist habitat conditions to driest habitat conditions.

Common Name	Scientific Name
Forest Floor Species	
Herbs	
Virginia wild rye	*Elymus virginicus*
Stinging nettle	*Laportea canadensis*
Richweed	*Pilea pumilia*
Cane	*Arundinaria gigantea*
MIXED LOWLAND TYPE	
Trees	
Blue beech	*Carpinus caroliniana*
Box elder	*Acer negundo*
Green ash	*Fraxinus pennsylvanica*
White ash	*Fraxinus americana*
American elm	*Ulmus americana*
Hackberry	*Celtis laevigata*
Bitternut hickory	*Carya cordiformis*
Red bud	*Cercis canadensis*
Forest Floor Species	
Shrubs	
Buckbrush	*Symphorocarpos orbiculatus*
Spicebush	*Lindera bezoin*
Paw-paw	*Asimina triloba*
Herbs	
Hooded violet	*Viola cucullata*
Virginia anemone	*Anemone virginiana*
Sedge	*Cyperus* sp.
Bedstraw	*Galium* spp.
Vines	
Wild grape	*Vitis cordifolia*
MESIC UPLAND TYPES	
NORTHERN RED OAK TYPE	
Trees	
Northern red oak	*Quercus borealis*
White oak	*Quercus alba*
Mockernut hickory	*Carya tomentosa*
Black hickory	*Carya texana*
White hickory	*Carya alba*
Flowering dogwood	*Cornus florida*
White ash	*Fraxinus americana*
Serviceberry	*Amalanchier arborea*
Red maple	*Acer rubrum*
Forest Floor Species	
Shrubs and Vines	
Hazelbrush	*Corylus americana*
Buckbrush	*Symphorocarpos orbiculatus*
Virginia creeper	*Parthenocissus quinquefolia*

Common Name	Scientific Name
Herbs	
Richweed	*Pilea pumila*
Wild yam	*Dioscorea villosa*
Bedstraw	*Galium* spp.
Hog peanut	*Amphicarpa bracteata*

WHITE OAK TYPE

Trees	
White oak	*Quercus alba*
Mockernut Hickory	*Carya tomentosa*
Shagbark Hickory	*Carya ovata*
Northern Red Oak	*Quercus borealis*
Sugar Maple	*Acer saccharum*
Black Hickory	*Carya texana*
Red Maple	*Acer rubrum*
Serviceberry	*Amalanchier arborea*
Ironwood	*Ostrya virginiana*
Forest Floor Species	
Shrubs and Vines	
Buckbrush	*Symphorocarpos orbiculatus*
Dryland blueberry	*Vaccinium vacillans*
Virginia creeper	*Parthenocissus quinquefolia*
Herbs	
Beggerweed	*Desmodium* spp.
Richweed	*Pilea pumila*
Hog peanut	*Amphicarpa bracteata*
Scullcap	*Scutellaria ovata*
Bedstraw	*Galium* spp.

DRY UPLAND TYPES

BLACK OAK TYPE

Trees	
Black oak	*Quercus velutina*
Flowering Dogwood	*Cornus florida*
White oak	*Quercus alba*
Post oak	*Quercus stellata*
Mockernut hickory	*Carya tomentosa*
Black hickory	*Carya texana*
Forest Floor Species	
Shrubs and Vines	
Dryland blueberry	*Vaccinium vacillans*
Sweet sumac	*Rhus aromatica*
Hazelbrush	*Corylus americana*
Virginia creeper	*Parthenocissus quinquefolia*
Wild grape	*Vitis cordifolia*

Common Name	Scientific Name
Herbs	
Beggerweed	*Desmodium* spp.
Poverty oat grass	*Danthonia spicata*
Panic grass	*Panicum* spp.
Hog peanut	*Amphicarpa bracteata*
Goldenrod	*Solidago* spp.
Aster	*Aster* spp.

POST OAK TYPE

Trees

Post oak	*Quercus stellata*
Black oak	*Quercus velutina*
Blackjack oak	*Quercus marilandica*
Mockernut hickory	*Carya tomentosa*
Southern red oak	*Quercus falcata*
Black hickory	*Carya texana*
Winged elm	*Ulmus alata*

Forest Floor Species

Shrubs

Dryland blueberry	*Vaccinium vacillans*
Buckbrush	*Symphorocarpos orbiculatus*
Deerberry	*Vaccinium staminium*
Sweet sumac	*Rhus aromatica*

Herbs

Beggerweed	*Desmodium pauciflorum*
Fall panic grass	*Panicum lanuginosum*
Poverty oat grass	*Danthonia spicata*
Anamolus aster	*Aster anamolus*
Hog peanut	*Amphicarpa bracteata*
Rabbit tobacco	*Antennaria plantaginifolia*
Perfoliate aster	*Aster patens*
Goldenrod	*Solidago* spp.
Stiff sunflower	*Helianthus divaricatus*

PINE-HARDWOOD TYPE

Trees

Shortleaf pine	*Pinus echinata*
White oak	*Quercus alba*
Black oak	*Quercus velutina*
Black hickory	*Carya texana*
Red maple	*Acer rubrum*
Flowering dogwood	*Cornus florida*
Winged elm	*Ulmus alata*
Sparkleberry	*Vaccinium arborium*

Common Name	Scientific Name
Forest Floor Species	
Shrubs and Vines	
Dryland blueberry	*Vaccinium vacillans*
Poison ivy	*Rhus toxicodendron*
Buckbrush	*Symphorocarpos orbiculatus*
Virginia creeper	*Parthenocissus quinquefolia*
Herbs	
Beggerweed	*Desmodium* sp.
Poverty oat grass	*Danthonia spicata*
Panic grass	*Panicum* sp.
Rabbit tobacco	*Antennaria plantaginifolia*
Bedstraw	*Galium* spp.
Aster	*Aster* spp.
Goldenrod	*Solidago* spp.
GLADE TYPE	
Trees	
Red Cedar	*Juniperus virginiana*
Post oak	*Quercus stellata*
Black oak	*Quercus velutina*
Blackjack oak	*Quercus marilandica*
Winged elm	*Ulmus alata*
Persimmon	*Diospyros virginiana*
Sparkleberry	*Vaccinium arborium*
Forest Floor Species	
Shrubs and Vines	
Sumac	*Rhus copallina*
Greenbrier	*Smilax bonanox*
Sweet sumac	*Rhus aromatica*
Herbs	
Little bluestem	*Andropogon scoparius*
Beggerweed	*Desmodium canescens*
Panic grass	*Panicum* sp.
Rabbit tobacco	*Antennaria plantaginifolia*
Goldenrod	*Solidago* spp.
Aster	*Aster* spp.

ENVIRONMENTAL EVALUATION REPORT
APPENDIX B
EFFECTS OF MAINSTEM LAKE ON THE OCCURRENCE OF FISH SPECIES IN BIG MULBERRY CREEK, BIG MULBERRY BASIN IN FRANKLIN, MADISON, NEWTON, JOHNSON, AND CRAWFORD COUNTIES, ARKANSAS

Prepared by

University of Arkansas

for the
U. S. Army Corps of Engineers
Little Rock District

Little Rock, Arkansas
October 1972

APPENDIX B
EFFECTS OF MAINSTEM LAKE ON THE OCCURRENCE OF FISH SPECIES IN THE MULBERRY RIVER VALLEY*

Species	Effects of Lake
Spotted gar (*Lepisosteus oculatus*)	+
Longnose gar (*L. osseus*)	+
Gizzard shad (*Dorosoma cepedianum*)	+
Threadfin shad (*D. petenense*)	+
Stonerollers (*Campostoma anomalum*)	-
Carp (*Cyprinus carpio*)	+
Bigeye chub (*Hybopsis amblops*)	-
Golden shiner (*Noremigonus crysoleucas*)	+
Emerald shiner (*Notropis atherinoides*)	+
Bigeye shiner (*N. boops*)	+
Ghost shiner (*N. buchanani*)	+
Wedgespot shiner (*N. greenei*)	-
Red shiner (*N. lutrensis*)	+
Redfin shiner (*N. umbratilis*)	-
Steelcolor shiner (*N. whipplei*)	+
Bluntnose minnow (*Pimephales notatus*)	+
Bullhead minnow (*P. vigilax*)	+
Creek chub (*Semotilus atromaculatus*)	-
River carpsucker (*Carpiodes carpio*)	+
Northern hog sucker (*Hypentelium nigricans*)	-
Smallmouth buffalo (*Ictiobus bubalus*)	+
Bigmouth buffalo (*I. cyprinellus*)	+
Spotted sucker (*Minytrema melanops*)	-
Black redhorse (*Moxostoma duguesnei*)	+
Golden redhorse (*M. erythrurum*)	+
River redhorse (*M. carinatum*)	+
Channel catfish (*Ictalurus punctatus*)	+

---

* Olmsted, L. O., and D. G. Cloutman. Personal Communication.

* Olmsted, L. O., G. D. Hickman, and D. G. Cloutman. 1972. A survey of the fishes of the Mulberry River, Arkansas. Water Resources Research Center. Publication No. 10, University of Arkansas, Fayetteville, Arkansas.

Plus (+) indicates that the species will remain after impoundment, minus (-) indicates that the species will disappear.

Species	Effects of Lake
Slender madtom (Noturus exilis)	-
Flathead catfish (Plyodictis olivaris)	+
Blackspotted topminnows (Fundulus olivaceus)	+
Mosquitofish (Gambusia affinis)	+
Brook silversides (Labidesthes sicculus)	+
Mississippi silversides (Menidia audens)	+
White bass (Morone chrysops)	+
Green sunfish (Lepomis cyanellus)	+
Warmouth (L. gulosus)	+
Bluegill (L. macrochirus)	+
Longear sunfish (L. megalotis)	+
Redear sunfish (L. microlophis)	+
Smallmouth bass (Micropterus dolomieui)	-
Spotted bass (M. punctulatus)	+
Largemouth bass (M. salmoides)	+
White crappie (Promoxis annularis)	+
Black crappie (P. nigromaculatus)	+
Greenside darter (Etheostoma blennioides)	-
Fantail darter (E. flabellare)	-
Cypress darter (E. proelieare)	-
Stippled darter (E. punctulatum)	-
Orangethroat darter (E. spectabile)	+
Redfin darter (E. whipplei)	-
Banded darters (E. zonale)	-
Logperch (Percina caprodes)	+
Blacksided darters (P. maculata)	-
Channel darter (P. copelandi)	+
Longnose darter (P. nasuta)	-
Freshwater drum (Aplodinotus grunniens)	+

ENVIRONMENTAL EVALUATION REPORT
APPENDIX C
EFFECTS OF MAINSTEM LAKE ON THE
OCCURRENCE OF BIRD SPECIES IN
THE MULBERRY RIVER VALLEY, BIG MULBERRY BASIN
IN FRANKLIN, MADISON, NEWTON, JOHNSON, AND
CRAWFORD COUNTIES, ARKANSAS

Prepared by

University of Arkansas

for the
U. S. Army Corps of Engineers
Little Rock District

Little Rock, Arkansas
October 1972

APPENDIX C
EFFECTS OF MAINSTEM LAKE
ON THE OCCURRENCE OF BIRD SPECIES
IN THE MULBERRY RIVER VALLEY*

A. Year-round Residents:

Species	Breeding	Wintering
Pied-billed Grebe		+
Great Blue Heron	0	0
Wood Duck	-	
Turkey Vulture	0	0
Black Vulture	0	0
Cooper's Hawk	0	
Red-tailed Hawk	-	-
Red-shouldered Hawk	-	
Sparrow Hawk		+
Bobwhite	-	-
American Coot		+
Kildeer	+	
Mourning Dove	-	-
Roadrunner	-	-
Screech Owl	-	-
Great Horned Owl	-	-
Barred Owl	-	-
Belted Kingfisher	+	+
Yellow-shafted Flicker		-
Pileated Woodpecker	-	-
Red-bellied Woodpecker	-	-
Red-headed Woodpecker	+	+
Hairy Woodpecker	-	-
Downy Woodpecker	-	-

---

* James, D., and F. James. Personal Communication.

* James, D., and F. James. 1964. The seasonal occurrences of Arkansas Birds. Ark. Acad. Sci. 18:20-30.

* James, F. 1967. Summer birds along the Buffalo River. Ozark Society Bull. 1(3):6.

Plus (+) indicates an increase in species after impoundment; minus (-), a decrease; zero (0), unchanged, and blank space indicates species not present.

(Year-round Residents)

Species	Breeding	Wintering
Eastern Phoebe	-	
Blue Jay	-	-
Common Crow	-	-
Carolina Chickadee	-	-
Tufted Titmouse	-	-
White-breasted Nuthatch	-	-
Carolina Wren	-	-
Mockingbird	-	-
Brown Thrasher	-	
Robin		-
Eastern Bluebird	-	-
Loggerhead Shrike	-	-
Brown-headed Cowbird	-	
Cardinal	-	-
American Goldfinch	-	-
Field Sparrow	-	-

B. Summer Residents Only:

Species	Breeding
Green Heron	-
Yellow-crowned Night Heron	-
Broad-winged Hawk	0
Yellow-billed Cuckoo	-
Chuck-will's-widow	-
Whip-poor-will	0
Ruby-throated Hummingbird	-
Eastern Kingbird	+
Great Crested Flycatcher	-
Acadian Flycatcher	-
Eastern Wood Pewee	0
Catbird	-
Wood Thrush	0
Blue-gray Gnatcatcher	-
Bell's Vireo	-
Yellow-throated Vireo	-
Black and White Warbler	0
Prothonotary Warbler	-
Parula Warbler	0
Cerulean Warbler	-
Yellow-throated Warbler	-

(Summer Only)

Species	Breeding	Wintering
Louisiana Waterthrush	-	
Kentucky Warbler	-	
Yellowthroat	-	
Yellow-breasted Chat	-	
American Redstart	-	
Orchard Oriole	-	
Summer Tanager	-	
Blue Grosbeak	-	
Indigo Bunting	-	
Painted Bunting	-	

C. Winter Residents Only:

Horned Grebe		+
Canada Goose		(if managed)
Snow Goose		(if managed)
Blue Goose		(if managed)
Mallard		+
Gadwall		+
Pintail		+
Green-winged Teal		+
American Widgeon		+
Shoveler		+
Ring-necked Duck		+
Lesser Scaup		+
Bufflehead		+
Harlan's Hawk		-
Bald Eagle		+
Yellow-bellied Sapsucker		-
Grown Creeper		-
Hermit Thrush		-
Golden-crowned Kinglet		-
Ruby-crowned Kinglet		-
Cedar Waxwing		-
Myrtle Warbler		-
Purple Finch		-
Pine Siskin		-
Slate-colored Junco		-
Harris' Sparrow		-
White-crowned Sparrow		-
White-throated Sparrow		-
Fox Sparrow		-
Song Sparrow		-

ENVIRONMENTAL EVALUATION REPORT
APPENDIX D
EFFECTS OF MAINSTEM LAKE ON THE
OCCURRENCE OF MAMMAL SPECIES IN
THE MULBERRY RIVER VALLEY, BIG MULBERRY BASIN
IN FRANKLIN, MADISON, NEWTON, JOHNSON, AND
CRAWFORD COUNTIES, ARKANSAS

Prepared by

University of Arkansas

for the
U. S. Army Corps of Engineers
Little Rock District

Little Rock, Arkansas
October 1972

APPENDIX D
EFFECTS OF MAINSTEM LAKE
ON THE OCCURRENCE OF MAMMAL SPECIES
IN THE MULBERRY RIVER VALLEY*

Species	Effects of Lake
Cottontail (*Sylvilagus floridanus*)	-
White-tailed Deer (*Odocoileus virginianus*)	+
Raccoon (*Procyon lotor*)	+
Opossum (*Didelphis marsupialis*)	+
Eastern Fox Squirrel (*Sciurus niger*)	+
Eastern Flying Squirrel (*Glaucomys volans*)	+
Gray Squirrel (*Sciurus carolinensis*)	-
Eastern Chipmunk (*Tamias striatus*)	+
Otter (*Lutra canadensis*)	+
Mink (*Mustela vison*)	+
Muskrat (*Ondatra zibethicus*)	+
Gray Fox (*Urocyon cineroargenteus*)	+
Red Fox (*Vulpes fulva*)	+
Bobcat (*Lynx rufus*)	+
Prairie Mole (*Scalopus aquaticus*)	-
Least Shrew (*Cryptotis parva*)	-
Short-tailed Shrew (*Blarina brevicauda*)	-
Brazilian Free-tailed Bat (*Tadarida brasiliensis*)	+
Silver-haired Bat (*Lasionycteris noctivagans*)	+
Twilight Bat (*Nycticeius humeralis*)	+
American Beaver (*Castor canadensis*)	+
Cotton Mouse (*Peromyscus gossypinus*)	+
Wood Mouse (*P. leucopus*)	+
Pine Vole (*Microtus pinetorum*)	-
Striped Skunk (*Mephitis mephitis*)	+
Long-tailed Weasel (*Mustela frenata*)	+
Black Bear (*Ursus americanus*)	+

---

* Reagan, D. P. 1971. Personal Communication.

* Sealander, J. A. 1956. A provisional check-list and key to the mammals of Arkansas (with annotations). The Amer. Midland Naturalist. 56(2):257-296.

* U.S. Army Corps of Engineers, 1971. Environmental inventory of Big Mulberry Creek Basin in Franklin, Madison, Newton, Johnson, and Crawford Counties, Arkansas. U.S. Army Corps of Engineers, Little Rock District, Little Rock, Arkansas.

Plus (+) indicates that the species will be present after impoundment, minus (-) indicates that it will be absent.

Species	Effects of Lake
Red Bat (Lasiurus borealis)	+
Hoary Bat (L. cinereus)	+
Eastern pipistrelle (Pipistrellus subflavus)	-
Big Brown Bat (Eptesicus fuscus)	-
Deer Mouse (Peromyscus maniculatus)	+
Mountain Lion (Felis concolor)	+
Coyote (Canis latrans)	-
Wood Rat (Neotoma floridana)	+